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Protective clothing and equipment for use in violent situations and in training —

Part 4: Limb protectors — Requirements and test methods

ICS 13.310; 13.340.10

Committees responsible for this British Standard

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- APSS — Association of Police and Public Security Suppliers
- Association of Chief Police Officers in Scotland
- BSIF Test and Certification Association
- British Association for Chemical Specialities
- British Association of Women Police
- British Clothing Industry Association
- British Glove Association
- British Textile Technology Group
- Defence Industries Association
- Department of Health — Medical Devices Agency
- Home Office
- Ministry of Defence — UK Defence Standardization
- National Association of Healthcare Safety and Risk Practitioners
- Personal Safety Manufacturers' Association
- Police Federation of England and Wales
- Police Purchasing Manager Association
- Police Uniform Project Group
- SATRA Technology Centre
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Foreword

This part of BS 7971 has been prepared by Subcommittee PH/3/12.

The following parts of BS 7971 are currently published or in preparation:

- *Part 1: General requirements;*
- *Part 2: Guidance on risk assessment and on the selection, use, cleaning and maintenance of protective clothing and equipment;*
- *Part 3: Personal defence shields — Requirements and test methods;*
- *Part 4: Limb protectors — Requirements and test methods;*
- *Part 5: Footwear — Requirements and test methods;*
- *Part 6: Gloves for protection against mechanical, thermal and chemical risks — Requirements and test methods;*
- *Part 7: Slash-resistant gloves — Requirements and test methods;*
- *Part 8: Blunt trauma body, shoulder, abdomen and genital protectors — Requirements and test methods;*
- *Part 9: Training suits and equipment — Requirements and test methods;*
- *Part 10: Coveralls — Requirements and test methods.*

It has been assumed in the drafting of this standard that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

WARNING. This British Standard calls for the use of substances and/or procedures that may be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

Product certification/inspection/testing. Users of this British Standard are advised to consider the desirability of third-party certification/inspection/testing of product conformity with the relevant parts of BS 7971. Appropriate conformity attestation arrangements are described in BS EN ISO/IEC 17025. Users seeking assistance in identifying appropriate conformity assessment bodies or schemes may ask BSI to forward their enquiries to the relevant association.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 25 and a back cover.

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Introduction

Limb protectors are items of protective clothing which are generally, but not exclusively, worn by serving police officers and prison officers whilst they are engaged in operational duties and in training. They are also used by civilians engaged in activities where the risks of attack and assault are similar, e.g. private security personnel, bullion handlers, escorts and couriers.

Limb protectors are intended to reduce the severity of, or prevent, soft tissue injuries resulting from blunt trauma to the areas covered. Such blunt trauma can arise as the result of impact from airborne missiles (house bricks, assorted types of bottle, metal bars, pieces of timber, fragments of wood, broken glass and slates, etc.), or can be due to assault by individuals using weapons such as bars, baseball bats and pieces of timber, or caused by individuals kicking or making violent physical contact with the wearer's body.

Limb protectors are not intended to provide ballistic protection or protection against blows from sharp or pointed instruments (e.g. axes, spikes and knives).

For certain user groups including police and prison officers, limb protectors constitute a second line of defence, with a personal defence shield providing a degree of primary protection (see BS 7971-3). Whilst shields do not always prevent impacts with the wearer's limbs or body by missiles or weapons, they can reduce the energy of impacts to levels at which limb protectors can have a significant effect in the reduction of soft tissue or skeletal injuries. At times, however, circumstances can dictate that the shield is dispensed with or placed in a position which leaves the user exposed to a direct impact or assault. In these circumstances limb protectors providing the highest level of protection are necessary.

Experience has shown that many areas of the body are at risk of impact in the attack scenarios described above. This standard specifies requirements and test methods for shoulder, upper arm, elbow and forearm, thigh and knee and shin protectors. However, other areas of the body can also be at risk of impact in these attack scenarios, so protective clothing and/or equipment to protect these areas is also necessary.

Limb protectors of three different performance levels are specified. Level 1 protectors provide an acceptable level of impact protection with minimal weight and ergonomic cost to the wearer. Level 2 and Level 3 protectors provide higher levels of impact protection but with increased ergonomic costs to the wearer. Level 3 protectors are suitable for use in training where repeated strikes are deliberately taken.

The test methods specified in this part of BS 7971 have been designed to measure the performance of limb protectors with respect to the protection they can be expected to provide against the commonly-faced hazards listed above. The severity of these tests cannot compare directly with the conditions to which police officers, prison officers and other users can be exposed in real life situations, but experience has shown that limb protectors which pass such tests can significantly reduce the incidence and/or severity of injuries.

1 Scope

This part of BS 7971 specifies performance requirements and test methods for limb protectors for use by police and prison officers and others who might be exposed to attack and assault in the course of their duties, for use in operational situations and in training.

NOTE 1 Information and guidance on the selection and use of limb protectors is given in Annex A.

NOTE 2 Guidance on risk assessment and the selection, care and maintenance of protective clothing and equipment for use in violent situations and in training is given in BS 7971-2¹⁾.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including amendments) applies.

BS 7971-1, *Protective clothing and equipment for use in violent situations and in training — Part 1: General requirements*.

¹⁾ In preparation.

3 Terms and definitions

For the purposes of this part of BS 7971, the terms and definitions given in BS 7971-1 and the following apply.

3.1

standard width knee and shin protector

knee and shin protector providing coverage to more than 50 % of the circumference of those parts of the user's leg covered by the protector and providing protection from wide angle frontal impacts

3.2

reduced width knee and shin protector

knee and shin protector providing coverage to less than 50 % of the circumference of those parts of the user's leg covered by the protector and providing protection from narrow angle frontal impacts only

4 Performance levels

Limb protectors shall be of one of three performance levels as specified in Table 1.

Table 1 — Performance levels for limb protectors

Performance level ^a	Hazard level	Examples of intended use
1	Low	In conjunction with a long shield. Where opponents are expected to be bare handed or at some distance
2	Moderate	Where close contact with opponents is expected
3	High	Where close contact with determined opponents is expected and the user does not have the protection of a long shield, and in training situations where impacts are deliberately taken and may be severe
NOTE The determination and strength of the assailant determines the performance level of equipment that is necessary. However, highly trained users might wish to choose products offering less impediment and less protection when they judge their risk of injury is reduced by their skill.		
^a See also BS 7971-1.		

5 Construction and performance requirements

5.1 General

Limb protectors shall conform to the general requirements for protective clothing and equipment for use in violent situations and in training specified in BS 7971-1, as applicable.

5.2 Sizing

Limb protectors shall be marked with a size designation. The size shall be related to the body dimensions of the intended wearer, and the relationship shall be explained in the information supplied by the manufacturer as specified in BS 7971-1. Body height, chest girth or bust girth, and waist girth shall be used as control dimensions for sizing limb protectors. Sizing shall be verified in accordance with 6.2. For protectors that are stated to fit a range of differently sized people, the values of the control body dimensions of the largest size of user that the protector is stated to fit shall be used for sizing.

5.3 Minimum dimensions of zones of protection and test areas

Limb protectors shall have one or more zones of protection which shall have the dimensions required for the largest size of user for whom the protector is designated by the manufacturer. The positions and dimensions of the zones of protection, relative to the coverage provided by the entire protector, shall be stated in the information supplied by the manufacturer as specified in BS 7971-1.

Test areas for shoulder, upper arm, thigh and shin protectors shall have the same dimensions as the zones of protection.

NOTE The zone of protection on shoulder protectors may be reduced by a cut-out with a maximum depth of 20 mm, as shown by the dashed line in Figure 1.

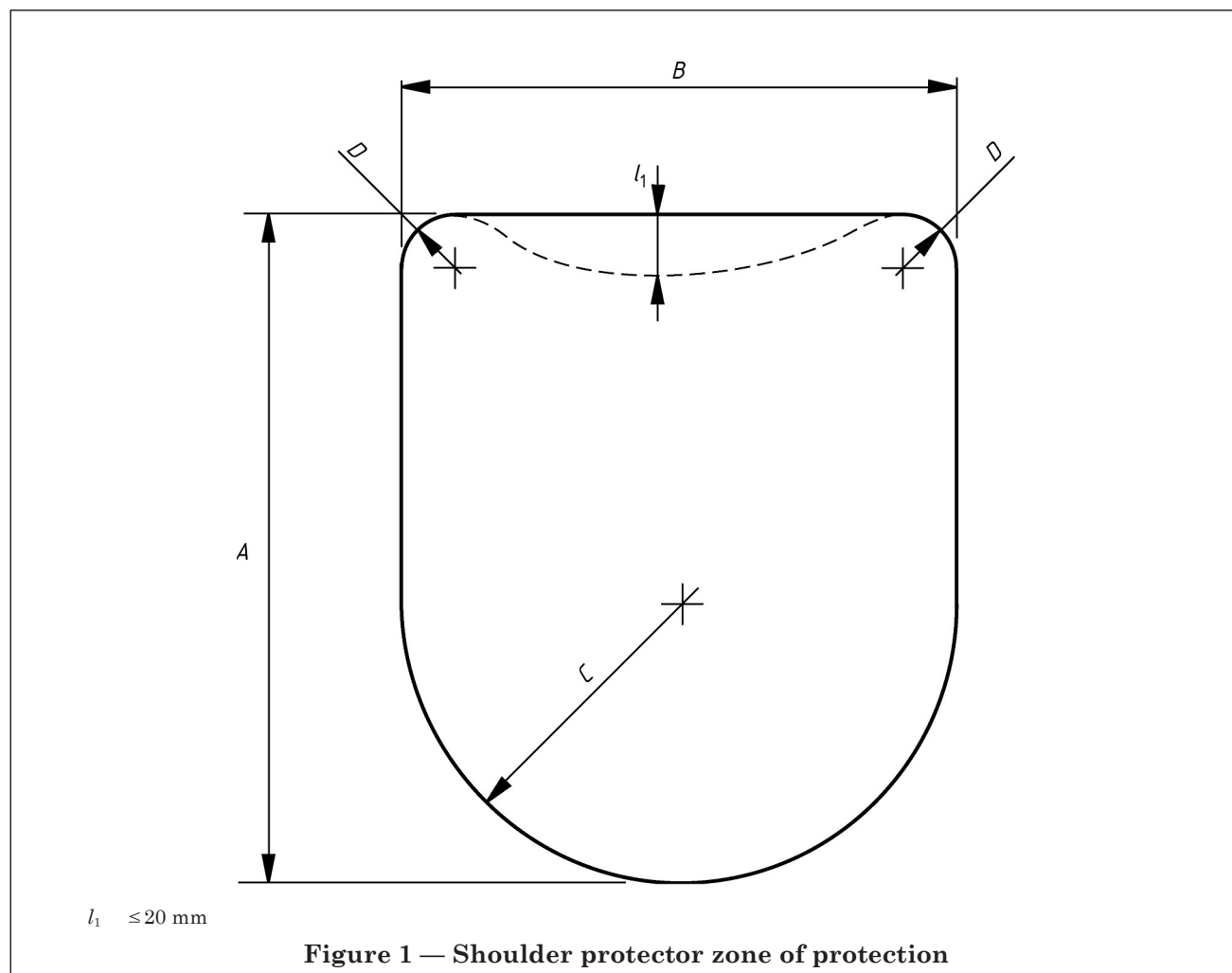
The zones of protection of elbow and forearm protectors, and knee and shin protectors shall be divided into test areas as shown in Figure 3 and in Figure 5 and Figure 6, respectively.

Marking of the outlines of the zones of protection and test areas prior to mechanical testing shall be carried out in accordance with 6.2. The protectors shall have one or more zones of protection equal to or greater in extent than the minimum areas specified in Table 2 and illustrated in Figure 1 to Figure 7.

Assessment of the zones of protection shall be made in accordance with 6.2.

Table 2 — Dimensions of zones of protection of limb protectors

Protector type	Control dimension	Dimension of zone of protection as a percentage of control dimension	Letter identifying the dimension on Figure 1 to Figure 7
Shoulder (Figure 1)			
Minimum overall width	Chest girth	20.00	B
Minimum overall length	Chest girth	23.00	A
Maximum radius of distal corners (shoulder joint)	Chest girth	10.00	C
Maximum radius of proximal corners (neck joint)		< 25 mm	D
Upper arm (Figure 2)			
Minimum overall length	Height	9.50	E
Minimum width	Height	8.00	F
Maximum radius of proximal corners (shoulder joint)	Height	1.75	G
Maximum radius of distal corners (elbow joint)	Height	4.70	H
Elbow and forearm (Figure 3)			
Minimum overall length	Height	18.20	I
Minimum radius of elbow zone	Height	3.95	K
Minimum width at wrist	Height	7.00	J
Maximum radius of corners	Height	1.75	L
Thigh (Figure 4)			
Minimum length of posterior edge	Height	17.50	M
Minimum length of anterior edge	Height	7.50	N
Minimum width	Waist girth	18.50	O
Minimum radius of upper posterior corner	Waist girth	5.00	P
Maximum radius of other corners	Height	1.75	Q
Standard width knee and shin (Figure 5)			
Minimum length	Height	25.50	R
Minimum radius of knee zone	Height	5.25	T
Minimum width at ankle	Height	10.00	S
Maximum radius of corners and of the instep cutout	Height	1.75	U
Reduced width knee and shin (Figure 6)			
Minimum length	Height	25.50	V
Minimum radius of knee zone	Height	4.60	X
Minimum width at ankle	Height	6.50	W
Maximum radius of corners and of the instep cutout	Height	1.75	Y
Shin (Figure 7)			
Minimum length	Height	17.50	Z
Minimum width at upper end near knee	Height	10.50	AA
Maximum radius of corners and of the instep cutout	Height	1.75	AC
Minimum width at ankle	Height	10.00	AB



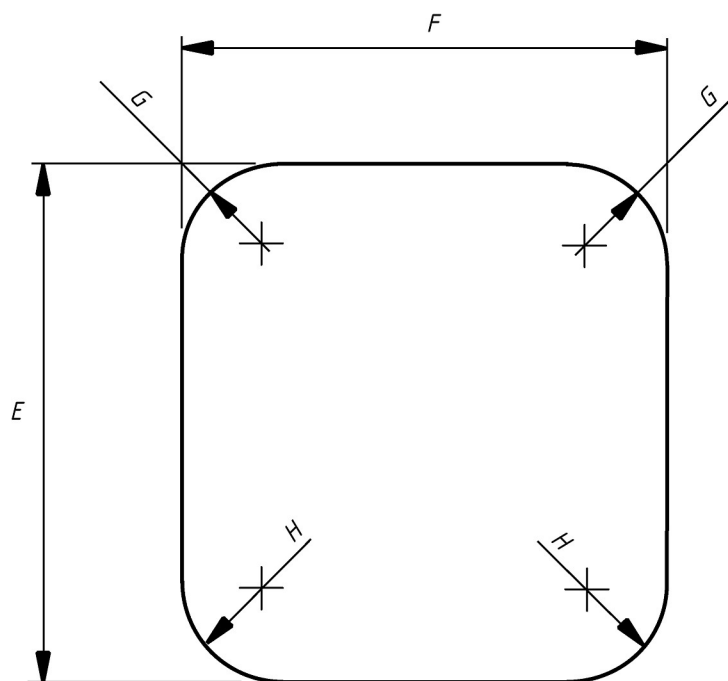


Figure 2 — Upper arm protector zone of protection